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CHAPTER 3 – WATER DISTRIBUTION

3.1 GENERAL INFORMATION

3.1.1 DEFINITIONS AND TERMS

- A. Private Water Service: Portion of the water line beginning two feet outside the outer foundation wall of the structure to the discharge side of the curb stop valve. Portion of the system located where no easements are granted to the City or in the public right-of-way if permitted. It shall be the responsibility of the owner the property to maintain the private water line from their building up to and including the connection to the discharge side of the City's curb stop valve. (080.040.010 (e) – Connections to Water System/Maintenance of Service Lines).
- B. Public Water Main: Portion of the system located within public right-of-way or easements and which are operated and maintained by the City. The City's responsibility includes the water main and appurtenances to and including the curb stop valve. (080.040.010 (e) – Connections to Water System/Maintenance of Service Lines).
- C. Backflow Tester: A person who has been certified by the State of Colorado to test and maintain backflow devices (060.030.020 - IRC; 060.040.020 - IPC).

3.1.2 GENERAL CONSIDERATIONS

- D. The Water Design Standards establish minimum design standards for designing, permitting, furnishing, installing, and maintaining the City of Glenwood Spring's public water utility distribution system, including water transmission and storage facilities for domestic, fire protection, commercial and industrial, irrigation, and other uses.
- E. The content of this manual shall be used in conjunction with the latest revisions of the following supplementary standards:
 - 1. Colorado Department of Public Health and Environment's (CDPHE) Standards:
 - a) Regulation 11, Colorado Primary Drinking Water Regulations.
 - b) Safe Drinking Water Program Policy DW-005, Design Criteria for Potable Water Systems.
 - c) Safe Drinking Water Program Policy DW-007, Backflow Prevention and Cross-Connection Control.
 - d) Colorado Cross-Connection Control Manual.
 - 2. American Water Works Association Standards.
 - 3. City of Glenwood Springs Fire Department requirements.
- F. Any extension/connection of the Glenwood Springs Water System must be approved by the City and shall be made in accordance with provisions of these Standards and the supplementary standards mentioned above. Where there are conflicts or differences between these Standards and other standards listed above, these Standards shall govern. (080.040.010 (a) – Connections to Water System/Requirement, 080.040.030 - Line Extensions).

- G. In designing and planning for any development, it is the developer's responsibility to see that adequate water for both domestic and fire protection use is attainable. The developer must demonstrate in the proposed plans how water will be provided, whether the existing system will be adversely impacted, how adequate water will be supplied at the required pressures in the event of a fire, and where water will be stored to provide for the development's water storage requirements. Design of water system infrastructure shall be by a registered engineer in the State of Colorado and will be reviewed by the City for compliance with these Standards.
- H. Any person who wishes to connect onto the City's water system must first make an application for such connection to the City, obtain necessary permits (060.130 – Miscellaneous Permits), and pay the necessary fees (080.040.010 (c) - Tap Fee; 080.040.010 (b) - City Permission; 080.0660.040 - Amount of System Improvements Fees) for such connection.
- I. Prior to receiving water from the City's system, all improvements must be completed, accepted by the City and approved, including granting of right-of-way or easements, and all applicable fees must be paid. (080.010.020 - Requests for Service; 080.040.010 - Connections to Water System).
- J. Easements for water mains and other facilities shall be provided in accordance with Chapter 1. (070.040.030 (e)(7) – Underground Utilities).
- K. No person shall abandon any water service connection to the City's water distribution system without first obtaining the necessary permits and written authorization through the City.
- L. With the exception of private water services defined in these Standards, all water lines and fire hydrants constructed pursuant to these Standards shall be and become the sole and exclusive property of the City, as well as any and all easements and rights-of-way therefore; and all such persons paying for the same shall, upon request of the City, execute and deliver any and all necessary and proper deeds of conveyance, assignments or other documents which the City may desire to perfect such ownership by the City. (080.040.010 (e) Maintenance of Service Lines; 080.040.030(a) - Construction of Waterlines and Appurtenances; 080.040.030(d) - Ownership of Extension).
- M. The City W/WW Department staff shall be onsite to observe, inspect, and approve ANY work that may affect water or sewer mains 080.040.030(a) - Construction of Waterlines and Appurtenances.
- N. All work upon or in connection with any portion of the water system of the City or any utilities which connect thereto shall be done by the City or by a qualified contractor that is specifically granted permission by the City. Such work shall be performed in conformity with the Design Criteria of the CDPHE, these Standards and the rules and regulations of the City. Such work shall be inspected and approved by the City. 080.040.030(a) - Construction of Waterlines and Appurtenances.
- O. All water service connections to existing water mains and all taps to existing mains shall be made by City personnel at the expense of the Contractor, unless the Contractor is specifically granted permission to perform the tap or service connection at the Contractor's expense. If the Contractor is granted permission by the City to perform the tap, the City shall be present at the time of the tap to observe and inspect the work. 080.040.030(a) - Construction of Waterlines

and Appurtenances; 070.040.030 (a)(1) Site Development and Improvement Standards/Purpose.

- P. The City shall be given 72 hours' notice prior to scheduling a shutdown of the water system. A Contractor that requests shutdown of the water system shall be responsible for providing a minimum of 72-hours advanced notification to all customers that may be affected by the shutdown.
- Q. The City equipment including valves, curb stops, and hydrants shall be operated only by City employees.
- R. During the construction of mains and services, the Contractor shall cap, plug, or secure the ends of such lines whenever the project is shut down at the end of the day so that contaminants will not enter the lines.
- S. The City shall be notified a minimum of 72 hours in advance of the time that a tap connection to an existing main or a service connection to an existing main is needed so that the water division crew may be scheduled for the work. At the time of notification, the customer must also notify the City of the requested water tap sizes. Tap size shall not be larger than what is allowed by City EQR schedule as calculated by the Building Department (080.040.010 (d) - Service Connections).
- T. All lines shall be disinfected and tested by the Contractor, with a representative of the City present, in accordance with the standard specifications. De-chlorination, collection, and disposal of any water used for disinfection shall be the responsibility of the Contractor. Water shall only be discharged at a location approved by the City and in accordance with the City's Wastewater Discharge Standards (080.030.030 - Wastewater Discharge Standards).
- U. No occupant or owner of any building or premises which obtains water from the City water system shall supply/re-sell water to other persons or families or to other premises. The water supply may be discontinued for any violation of this Section. (080.040.050 - Customers not to Supply Water to Others).
- V. 2-year warranty (080.040.030 (a) - Construction of Waterlines and Appurtenances; 070.040.030 (f)(2) – Acceptance by City of Public Improvements.
- W. Connection to raw water system - required within 400' (080.040.015 – Connections to Raw Water Irrigation System; 070.040.050 – Irrigation System Design.

3.1.3 REQUESTS FOR WATER SERVICE AND REQUIRED PRE-CONSTRUCTION SUBMITTALS

- A. The following section covers the required submittal material required for the City to review a water project to ensure that it conforms to these standards/regulations. This information is in addition to the requirements of Chapter 1.
- B. Customers outside of the corporate limits – 080.040.030 (C) - Restrictions on Extensions
- C. The applicant shall provide documentation and proof that water and sewer taps have been obtained from appropriate utility district when the property will be served by the district.

060.030.020 – Amendments to IRC; 060.020.020 – Amendments to IBC 070.060.060 – Preliminary Plat Approval Criteria.

- D. The City requires the preparation of a water system analysis in order to assess the impacts and service demands of any project or development proposal connecting to the public water distribution system. The detailed analysis shall be prepared by an Engineer registered in the State of Colorado and include a technical report, preliminary plan, and connection and isolation plan as outlined in the following subsections.
- E. Technical Report: The technical report shall provide an overview of the proposed project or development, proposed water utility improvements, water service demands, system impact and feasibility, and basic design requirements, and include the following information:
 - 1. Water Demands: Include estimated water demands based on projected land use/service type, number of equivalent residential units (EQRs), and water demand per EQR.
 - 2. Apply peaking factors and summarize flows for each service type for the following conditions:
 - a) Peak-Hour (gallons-per-minute),
 - b) Maximum-Day (gallons-per-minute),
 - c) Average-Day (gallons-per-minute),
 - d) Insurance Service Office (ISO) or International Building Code (IBC) Fire Flows (gallons-per-minute), and
 - e) Irrigation (gallons-per-minute).
 - 3. Design Criteria: The technical criteria used for design shall be summarized for City review and comment. It shall include, but not be limited to, the following:
 - a) Equivalent Residential Units (EQRs) (080.060.020 - Classification).
 - b) Flow Types and Peaking Factors to Estimate Demands
 - c) Water Storage Requirements
 - d) Fire Volume, Equalization Volume, Emergency Volume, Total Water Storage Volume
 - e) Pipeline Maximum Velocity
 - f) System Water Pressures
 - 4. System Layout: Describe the proposed distribution system layout, including locations for connections with the existing water utility system.
 - 5. Network Analysis: Include a distribution network analysis as performed through computer simulation or appropriate manual calculation, identifying any systems impacts based on proposed demands and providing design solutions to ensure perpetuation of future water utility system growth and maintain system pressures and flow rates.
 - 6. NOTE: Computer simulations of hydraulic analyses are to be performed using electronic input data for the existing water system provided by the City on software compatible with

the “InfoWater” network analysis program. Computer analyses are to be submitted in both hard copy and electronic format.

7. Main Sizing: Indicate the required sizing of proposed distribution mains based on water demands and/or conveyance of fire flow, whichever condition requires the larger pipe.
 8. Design Alternatives: Discuss alternative system layouts and methods of providing water service, including an evaluation of each alternative and reasons for selecting the recommended design.
 9. Water Storage: Discuss storage volume necessary to serve additional EQRs consider part of new development and if that volume will be provided through excess storage in City’s existing storage tanks or in new water storage tank. Storage volume shall be calculated as directed in Sections below.
 10. Special Conditions: Identify any special conditions, such as the presence of erosive soils, conflicts with other utilities, unusual installation depths or oversizing requirements, that require special provisions for improvements construction.
- F. Preliminary Plan: A preliminary plan shall be included in the utility report to provide a plan view and reference for the proposed improvements, and identify issues addressed in the report. The preliminary plan is to include the following:
1. Preliminary Design: Illustrate proposed methods and alternatives for providing site water distribution and service.
 2. Property Boundaries: Reflect legal boundaries of the proposed project or development site, including existing and proposed property and lot lines, existing and proposed rights-of-way and utility easements, and boundaries of abutting properties.
 3. Topography: Include site topography at 2-foot interval contours, and the elevation and location of City-recognized benchmarks with reference to local, USGS and NGVD data.
 4. System Area: Define and delineate the system area included in the network analysis.
 5. Existing Utilities: Illustrate existing water utilities, including fire hydrants and valves, within 400 feet of the proposed development.
 6. Unusual Features: Identify unusual features, such as creeks, drainage facilities, railroads, and irrigation ditches, that might influence the location of underground utilities.
 7. Proposed System Layout: Illustrate the general layout of the proposed water distribution mains, storage tank, valves, and fire hydrant locations, including construction phasing.
 8. Storage Tank: Provide design information, if required, on proposed water storage tank such as height, diameter, materials of construction, elevations, proposed tank’s elevation relative to existing tank’s elevations, and enough details to ensure compliance with CDPHE’s Design Criteria for Potable Water Systems Chapter 7: Finished Water Storage.
 9. Booster Pump Stations: Provide design information, if required, on proposed water booster pump stations such as footprint, height, pump types, operating/design points,

and equipment summary for all pumps, valves, piping, HVAC, electrical, controls, and telemetry equipment. Provide sufficient detail to ensure compliance with CDPHE's Design Criteria.

10. Water Distribution Control Structures: Provide design information, if required, on proposed water control structures such as footprint, height, structure type, operating/design points, and equipment summary for all valves, piping, HVAC, electrical, controls, and telemetry equipment. Provide sufficient detail to ensure compliance with CDPHE's Design Criteria for Potable Water Systems Chapter 8: Distribution System Piping and Appurtenances (Water Distribution Control Structure shall refer to a pressure regulating/reducing valve, air release, check valve, or pressure relief valve installed within a vault).

G. Connection and Isolation Plan: A connection and isolation plan shall be provided in the utility report to identify proposed connection points with the existing water systems and design conditions for providing required system isolation for maintenance and flushing. The connection and isolation plan is to include the following:

1. Valve Locations: Identify all valves necessary to isolate a point of connection for the proposed water system onto the existing system. Existing system valves should be inspected for location and accessibility.
2. Thrust Restraint: Determine and include design and construction requirements for sufficient thrust restraint for existing water mains and valves at proposed connection points ("stub outs" and terminal extensions) to allow construction while the existing water system remains in service.
3. System Isolation: Identify water main sections that can be isolated within the proposed and existing water systems that provide for emergency maintenance and identify discharge points for system flushing.

3.1.4 DESIGN REVIEW POLICIES

A. See Chapter 1, regarding design review policies.

3.1.5 RECORD DRAWING SUBMITTAL

A. In addition to the requirements of Chapter 1, the following water distribution specific information shall be included on the record drawings

1. Pipe size and type details.
2. Service tap locations (include public or private demarcation points.
3. Fire hydrant locations.
4. All valves, fittings, curb boxes, hydrants, storage tanks, and other waterline appurtenances either below ground or at the ground surface shall have reference measurements to at least three prominent above ground objects. All such measurements shall be recorded on the set of record drawings and shall be provided to the City after the completion of the project.

3.1.6 CONSTRUCTION WATER USAGE POLICY

- A. All water used for construction purposes must be pre-approved by the City and users must follow the protocol outlined in the City's Construction Water and Fire Hydrant Usage policy.

3.1.7 CROSS CONNECTION AND BACKFLOW PREVENTION

- A. All water services must be properly protected from contamination or pollution by backflow due to cross connections from owner water systems. Refer to Sections 080.040.010 (f) - Cross Connection Requirements, of the City Municipal Code for comprehensive requirements. Note the following:
 - 1. Testable backflow devices shall not be installed below grade (060.040.030 - International Plumbing Code Commentary). City may consider alternate installation approaches, on a case-by-case basis, subject to the installation meeting CDPHE regulations and Colorado Cross Connection Control Manual requirements. 060.040.030 International Plumbing Code Commentary Amendments.
 - 2. Hazard survey is required.
 - 3. Annual testing required by certified tester (060.030.020 – Amendments to IRC).
 - 4. Report records must be submitted to the City.
 - 5. Whenever the use of an antifreeze compound becomes necessary, propylene glycol is recommended. Other antifreeze compounds may be used after written approval by the City Water Department. The use of ethylene glycol is not permitted. In areas where the use of an approved antifreeze is necessary, a readily visible, durable sign shall be posted stating "ETHYLENE GLYCOL PROHIBITED." The sign shall be in letters not less than one (1) inch high on a contrasting background. (060.030.020 – Amendments to IRC).

3.2 WATER MAIN LINES

3.2.1 GENERAL

- A. All materials including pipe, fittings, valves and fire hydrants must conform to the latest standards issued by the American Society of Testing and Materials (ASTM), the American Water Works Association (AWWA), the American Standards Association (ASA) and ANSI/NSF, where such standards exist, and be acceptable to the City.
- B. Pipes or pipe fittings must not contain more than 0.25% lead. All products must comply with ANSI/NSF standards.
- C. Gaskets containing lead must not be used. Manufacturer approved transition joints must be used between dissimilar piping materials.
- D. All materials used for the rehabilitation of water mains must meet ANSI/NSF standards.
- E. Used materials will not be accepted.
- F. Packing and jointing materials used in the joints of pipe must meet the standards of AWWA and the City. Pipe having mechanical joints or slip-on joints with rubber gaskets is preferred.

3.2.2 PIPE AND FITTINGS

- A. Refer to specification, Water Transmission and Distribution Lines for comprehensive material requirements. Note the following:
 - 1. The City's preferred material of water mains is Class 52 Ductile Iron Pipe. In potentially corrosive environments, C900 Polyvinyl Chloride (PVC) Pipe and fittings shall be required. Exceptions may be allowed by the City on a case-by-case basis.
 - 2. All pipe and services shall be installed with continuous tracer wire and tape.

3.2.3 CORROSION PROTECTION

- A. All ductile iron pipe and fittings shall be encased in polyethylene. The polyethylene encasement shall in be installed in such a way that it shall prevent contact between the pipe and the surrounding backfill and bedding material.

3.2.4 JOINT RESTRAINT AND THRUST PROTECTION

- A. All tees, bends, plugs, hydrants, etc. must be provided with concrete reaction blocking and joint restraint.
- B. Joint restraint shall the applicable style of megalug, (i.e. appropriate style for DIP or PVC).

3.2.5 MINIMUM PIPE SIZE

- A. The minimum size for mains shall be 8 inch inside diameter.
- B. The City shall be consulted as to the size of the watermain. Larger size mains are required in specific areas. Nothing shall preclude the City from requiring the installation of a larger sized main in areas not addressed in the Plan, if the City determines that a larger size is needed to meet fire protection requirements or for future service.

3.2.6 DEPTH OF BURY

- A. The minimum earth cover over water transmission and distribution lines shall be 5.5 feet. A greater depth shall be provided to avoid excessive high points in the main or where it is necessary to clear existing structures or obstructions. Water service lines shall have the same minimum cover. The Contractor shall be responsible for constructing water mains and services such that the required minimum cover is maintained.

3.2.7 MINIMUM SEPARATION DISTANCES FROM POLLUTION SOURCES

- A. Per CDPHE Design Criteria (reference documents attached), water mains shall be separated from pollution sources, as summarized below:
 - 1. Parallel Installation of potable water mains with interceptors and sewer mains, reclaim, and irrigation (raw water) pipelines shall be accomplished in a fashion to preclude contamination of the water facilities. The separation distance shall be measured edge to edge of the interceptor or sewer main and the water pipeline. The potable water mains shall be located no less than 10 feet away from (i.e., between pipes, outside to outside) the sewer main.

2. Water mains crossing sewer must be laid to provide a minimum vertical distance of 1.5 feet between the outside of the water main and the outside of the sewer. This is the case whether the water main is above or below the sewer with preference to the water main located above the sewer.
 3. At crossings, one full length of water pipe must be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
 4. Deviations to the horizontal separation distance are allowed, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at an elevation that the bottom of the water main is at least 1.5 feet above the top of the gravity sewer.
 5. If the interceptor or sewer main crosses over the water main but less than 1.5 feet of clear space will exist, either the sewer main or water pipe shall be installed in a pipe casing extending no less than the 9 feet each side of the water main centerline. The pipe casing shall be of watertight material with no joints. The casing pipe material may be steel, ductile iron, or PVC with suitable carrier pipe supports and casing pipe end seals. Alternatively, reinforced concrete encasement of the carrier pipe extending no less than 10 feet each side of the water main centerline may be used.
 6. If the interceptor or sewer main will cross above or over the water main, the interceptor or sewer main shall be installed in a pipe casing extending no less than 9 feet each side of the water main centerline.
 7. If the minimum clearances cannot be satisfied, the City will consider alternative designs on a case by case basis.
- B. Water service pipe and the building sewer shall be separated by 5 feet of undisturbed or compacted earth (060.040 - International Plumbing Code). Following exceptions apply:
1. The separation distance shall not apply where the bottom of water service pipe within 5 feet of the building sewer is a minimum of 12 inches above the top of the highest point of the sewer and the pipe materials conform to Table 702.3.
 2. Water service pipe is permitted to be located in the same trench with a building sewer, provided such sewer is constructed of materials listed in 702.2.

3.2.8 FUTURE CONNECTIONS

- A. Isolation Valve Required: When future main extensions are provided for by “stub out” or terminal connections, the stub out or terminal main extension shall be valved so that only one valve must be closed when the future main is extended. The valve shall be restrained to the existing distribution main to allow closure of the stub out or terminal main section without creating a pressure separation of the valve from the in-service distribution main.
- B. Valve Restraint: Valve restraint may be ensured by the use of a direct swivel connector or adapter, or by providing a pipeline extension that can restrain the valve through frictional resistance. Where valve restraint through frictional resistance of extended pipe line sections is

proposed, the Engineer shall determine the necessary pipe length required to provide adequate frictional resistance, subject to review and approval by the City.

- C. Thrust Restraint: Thrust restraint must be provided with concrete reaction blocking.
- D. Testing: When future connections are made, the entire main beyond the stub out or terminal main extension shall be flushed, chlorinated, and pressure tested.
- E. Service Taps Prohibited: No service taps shall be allowed on a stub out or on a terminal main beyond the isolation valve.
- F. A City standard 2" minimum blowoff assembly shall be installed on all permanent dead-end runs approved by the City, if fire hydrants are not located at the end. Wherever possible, the blowoff shall be installed in the street right-of-way, three feet from the curb and gutter. In no case shall the location be such that there is a possibility of back-siphonage into the distribution system. On water mains which will be extended in the future, the valve which operates the blowoff assembly shall be the same size as the main and provided with a concrete thrust block.

3.2.9 BEDDING

- A. Refer to specification, Trenching, Backfilling, and Compaction for comprehensive pipe bedding requirements. Note the following:
 - 1. Pipeline embedment material shall be Class 6 aggregate base course according to applicable details as illustrated in the Construction Drawings.
 - 2. Pipeline trench shall be backfilled in its entirety with Class 6 aggregate base course according to applicable details as illustrated in the Construction Drawings.

3.2.10 ENCASEMENT

- A. When water main encasements are required or requested by the City, the encasement shall be made using pipe casing in accordance with the details and specifications.
 - 1. Concrete pipe encasements are not preferred. Exceptions may be allowed through City Engineering Department on a case by case basis.
 - 2. Mains to be installed inside casings shall be installed with self-restraining casing spacers. Casing spacers shall provide axial thrust restraint to prevent pipe deflection during and after installation.

3.2.11 ABANDONMENT-IN-PLACE

- A. All pipes that are to be abandoned in place shall have the ends physically cut and capped with two linear feet of non-shrink grout.
- B. All valves that are to be abandoned in place (on abandoned mainlines) shall have the top section of the valve box and valve box lid removed. The resulting cavity shall be backfilled with Class 6 aggregate base and compacted to 95%. Surface patching and restoration shall be in accordance with Chapter 5.

3.2.12 PIPE INSTALLATION

- A. Refer to specification, Water Transmission and Distribution Lines for additional pipe installation requirements.

3.2.13 DISINFECTION

- A. Refer to specification, Water Transmission and Distribution Lines for disinfection requirements. Note the following:
 - 1. The City prefers the tablet method for disinfection. Other methods may be allowed through the City on a case by case basis.
 - 2. The general disinfection procedure is as follows:
 - a) Disinfection performed using the concentration/time required in AWWA Std,
 - b) collect high chlorine residual sample;
 - c) flush to background residual,
 - d) Collect bacteriological sample,
 - e) let water sit undisturbed for minimum time per AWWA Stds,
 - f) collect second bacteriological sample.
 - 3. Bacteriological sampling must be performed by a Colorado-certified laboratory.
 - 4. Contractor is responsible for all testing and record keeping. Contractor must certify in writing that all disinfection and required testing was performed. Test records must be submitted to the City.
- B. W/WW staff must be onsite to operate valves, observe high chlorine testing, flushing, bacteriological sampling
- C. W/WW staff must be onsite to operate valves, observe high chlorine testing, flushing, bacteriological sampling
- D. Contractor is responsible for proper dechlorination and disposal of water used for flushing. If necessary, contractor will need to install a tap for flushing. Once finished tap will need to be abandoned at main in accordance with these standards.

3.2.14 PRESSURE TESTING

- A. Refer to specification, Water Transmission and Distribution Lines for pressure testing requirements. Note the following:
 - 1. Prior to the acceptance of the project, the water main pipe shall be flushed, subjected to a hydrostatic pressure test, and disinfected in accordance with specification, Water Transmission and Distribution Lines. The Contractor shall furnish all equipment and personnel for conducting the tests under the observation of the City inspector. The testing equipment shall be subject to approval.
 - 2. Tests shall be made after all connections have been made and the roadway section has been constructed to grade. The Contractor shall keep a record of the flushing and volume of

water used from the City system in flushing and testing and shall provide the City Inspector with the report prior to acceptance of the main.

3. A main shall not be tested until the lines have been flushed of chlorine. The contractor shall flush the pipelines by a means in accordance with good practice. The flushing shall be made through an open pipe end.
4. At no time shall chlorinated water from a new main be flushed into a body of fresh water. This is to include lakes, rivers, streams, drainage ways, and any and all other waters where fish or other water life can be expected.
5. If connecting to an existing water main at an existing valve, the existing valve must be pressure tested to City standards prior to connection. If an existing valve fails to pass the test, the Contractor shall make the necessary provisions to test the new line prior to connection to the existing system or install a new valve.
6. All equipment used for pressure testing must be properly disinfected before being connected to the system.
7. City needs to be onsite to observe the entirety of the pressure test.

3.2.15 INSPECTION AND ACCEPTANCE

- A. Prior to backfilling, all water lines and appurtenances shall be inspected and approved by the City. Approval shall not relieve the Contractor for correction of any deficiencies and/or failure as determined by subsequent testing and inspections. It shall be the Contractor's responsibility to notify the City for the required inspections.
- B. City will not accept the new line until records of the pressure testing and bacteriological tests are received.

3.3 VALVES

3.3.1 GENERAL

- A. All materials including pipe, fittings, valves and fire hydrants must conform to the latest standards issued by the American Society of Testing and Materials (ASTM), the American Water Works Association (AWWA), the American Standards Association (ASA) and ANSI/NSF, where such standards exist, and be acceptable to the City.

3.3.2 MATERIALS

- A. Refer to specification Water Transmission and Distribution Lines for comprehensive material requirements. Note the following:
 1. Gate valves shall be provided for sizes 4-inch through 10-inch.
 2. Butterfly valves shall be provided for sizes 12-inch and larger.
 3. Mud plugs required, also on detail
 4. Valve boxes – see section below

3.3.3 MINIMUM SPACING

- A. Valves shall be installed as necessary on water mains at the following locations:
 - 1. Every intersection, all sides of tees/crosses.
 - 2. No more than 600 feet of water main will be located between isolation valve zones (i.e., sections of main that may be taken out of service for maintenance activities).
 - 3. Where necessary to ensure that no more than three valves must be closed to isolate any section of a transmission main.
 - 4. No more than two fire hydrants will be located between isolation valve zones.
- B. Valves shall not be placed in locations that may be subject to routine parking or storage and shall not be placed within public sidewalks, multi-use paths, or on-street bike lanes.
- C. Valves shall be located to provide maximum accessibility for emergency access.
- D. Valves outside of paved areas shall be marked with a flexible delineator marker post with a blue reflector, such as Carsonite markers.

3.3.4 VALVE BOXES

- A. Valve boxes for gate valves 12 inches and smaller shall be centered and installed over each gate valve operator. Valve boxes shall be of such length as will be adapted, without full extension, to reach the ground surface above the pipe. The valve boxes shall be of cast iron, complete with cover, Buffalo type, two or three-piece, extension type with screw-on adjustment with #160 wide oval base to fit the valve to which it is to be used (Tyler 6850 Series). The cover shall have the word "water" cast on the top. All casting shall comply with country-of-origin marking laws. Boxes shall have 5-1/4 inch shafts. The minimum thickness of metal of the box shall be 1/4 inch. Each valve box shall be fitted with a debris cap or plug, S. W. Services, or approval equal.
- B. Larger meter setters/box shall be as approved by the City Engineer.
- C. Valve boxes shall be centered on the valves. Earth fill shall be carefully tamped around the box, or to the undisturbed trench face if less than 4 feet.

3.3.5 AIR RELEASE VALVES

- A. The design of any air release valves/vaults must be approved by the City and will be on a case by case basis. All designs/calculations shall be by a professional engineer registered in the State of Colorado.

3.3.6 PRESSURE REDUCING VALVES

- A. The design of any pressure reducing valves/vaults must be approved by the City and will be on a case by case basis. All designs/calculations shall be by a professional engineer registered in the State of Colorado.

3.3.7 INSPECTION AND ACCEPTANCE

- A. Refer to specification Water Transmission and Distribution Lines for installation requirements. Note the following:

1. Prior to backfilling, all hydrants and appurtenances shall be inspected and approved by the City. Approval shall not relieve the Contractor for correction of any deficiencies and/or failure as determined by subsequent testing and inspections. It shall be the Contractor's responsibility to notify the City for the required inspections.

3.4 FIRE HYDRANTS

3.4.1 HYDRANT LEAD SIZE

- A. The minimum size hydrant lead/pipe connecting to a fire hydrant shall be 6-inches.

3.4.2 EASEMENTS

- A. Easements: All fire hydrants shall be installed within public rights-of-way or easements. Easements shall be a minimum of 15 feet square centered on the hydrant.
- B. Hydrant lead valve to have same easement requirements.
- C. Main line easements shall have 20' wide easement centered over pipe

3.4.3 PLACEMENT AND ACCESSIBILITY

- A. The placement of fire hydrants shall comply with the City's most recent adoption of the International Fire Code.
- B. Snow removal (060.090.020 – Hydrant Access)

3.4.4 SPACING

- A. Spacing must meet minimum requirements of IFC and Building Code (070.030.110 - Water Distribution)
- B. In a single-family residential area, there shall be no more than 500 feet of fire access distance between hydrants. No dwelling unit shall be over 250 feet of fire access distance from the nearest hydrant.
- C. In all other areas, there shall be no more than 350 feet of fire access distance between hydrants. No exterior portion of any building shall be over 175 feet of fire access distance from the nearest hydrant.

3.4.5 RESTRAINT AND THRUST PROTECTION

- A. All hydrants must be provided with concrete reaction blocking and joint restraint.
 1. Joint restraint shall be the applicable style of megalug, (i.e. appropriate style for DIP or PVC).
 2. Rodding between the fire hydrant and tee may be considered by the City on a case by case basis.

3.4.6 DEPTH OF BURY

- A. Fire hydrants depth of bury shall be 5.5 feet minimum.

3.4.7 HYDRANTS ON PRIVATE SERVICES

- A. City maintains ownership of hydrants and hydrant lead lines on private service lines up to and including hydrant lead valve.

3.4.8 MATERIALS

- A. Refer to specification Water Transmission and Distribution Lines for comprehensive material requirements. Note the following:
 - 1. All fire hydrants for ordinary water works service shall be Mueller Super Centurion A423, or Kennedy K81D and conform to AWWA C 502.
 - 2. Each fire hydrant assembly shall be equipped with an auxiliary shut-off valve located between the water main and the fire hydrant as shown on the drawings. The auxiliary valve size shall be 6 inches, and is bolted directly to the tee. The branch piping from the main to the fire hydrant shall be 6 inch ductile iron pipe. (A MJ x swivel tee is allowed on branch.)

3.4.9 PRESSURE TESTING

- A. Refer to specification Water Transmission and Distribution Lines for testing requirements. Note the following:
 - 1. Hydrant shall be tested up against the hydrant lead valve.

3.4.10 DISINFECTION

- A. Refer to previous sections above for disinfection requirements. Disinfection procedures for hydrants shall be the same as water mains.

3.4.11 INSPECTION AND ACCEPTANCE

- A. Refer to specification Water Transmission and Distribution Lines for comprehensive inspection requirements. Note the following:
 - 1. Hydrants shall be bagged and marked out-of-service until the accepted and approved by the City.
 - 2. Prior to backfilling, all hydrants and appurtenances shall be inspected and approved by the City. Approval shall not relieve the Contractor for correction of any deficiencies and/or failure as determined by subsequent testing and inspections. It shall be the Contractor's responsibility to notify the City for the required inspections.

3.5 SERVICE LINES

3.5.1 GENERAL

- A. Only City W/WW Department staff may install the water service line between the City's main up to (and including) the curbstop shut-off valve. In certain circumstances—and only with pre-authorization—the City may approve a qualified contractor to install the service line and curb stop valve while under the City's direct supervision (080.040.030(a) - Construction of Waterlines and Appurtenances).

- B. The customer is responsible for all costs incurred by the City for the installation of the service line between the water main up to (and including) the curbstop valve 080.040.030(e) - Maintenance Responsibilities.
- C. The water service connection made on the customer-side of the water curbstop valve must be inspected and approved by City staff before the new water service will be turned on.

3.5.2 TAP SIZE

- A. The maximum size of a water service tap shall be based on the number of equivalent units (EQRs) established in Article 080.040.010 (d) - Service Connections.

3.5.3 DEPTH OF BURY

- A. Water services are recommended to follow same depth of bury requirements as water mains.

3.5.4 SERVICE TAP ABANDONMENT

- A. Any existing service tap that is no longer active or will not be used must be abandoned at the main. For ¾" to 2" services, the corporation stop and saddle must be removed and full circle repair clamp (12.5" width) must be installed. For services greater than 2", abandonment must follow procedures defined in Section 3.2.11, Abandonment-in-Place, above.
- B. Installation of a replacement tap will not be allowed by the City until all existing service taps are properly abandoned. Alternate abandonment schedules may be allowed by the City on a case-by-case basis.

3.5.5 MINIMUM DISTANCES FROM FITTINGS AND SERVICES

- A. The City requires a minimum of 5 feet between tap locations or any fittings along the water main line. If the minimum clearances cannot be satisfied, the City will consider alternative designs on a case by case basis.

3.5.6 COMBINED FIRE/DOMESTIC SERVICES

- A. A combination fire sprinkler/domestic service line is allowed from the City's water distribution main if the following conditions are met:
 - 1. The combination line shall be sized to convey maximum domestic service and fire sprinkler protection service flows. The maximum combination line size is 2 inches; otherwise, the combination line shall be separated into a dedicated fire sprinkler line and separate domestic service line, each tapped at the distribution main.
 - 2. The combination line shall separate into a domestic service line (with meter) and a dedicated fire sprinkler line (without meter, but with oriseal shutoff).
 - 3. Fire systems shall be separate or separated from domestic systems in such a way that both systems can be operated and tested at their respective pressures.

3.5.7 IRRIGATION SERVICES

- 1. Irrigation service lines shall serve no more than one individual property, unless approved by the City under the provisions of a homeowners association.

3.5.8 SERVICES CROSSING LOTS

A. Domestic water services crossing one lot to provide service to an adjacent lot may be approved if all of the following conditions are met:

1. The service crossing is part of a proposed subdivision creating only two lots.
2. A utility easement at least 10 feet wide is provided across, and situated entirely within, the boundaries of the proposed subdivision.
3. The easement is to be granted to the City for the benefit of the property owner being served and is to be occupied by the water service line only, or by the water and wastewater service lines only if the water and wastewater service lines are installed in compliance with these Standards.
4. The Director determines that a water main extension is not necessary to perpetuate the system, or that future development of abutting properties cannot benefit from a main extension.
5. The water service line is to be centered in the easement and be at least 5 feet from other utilities, except for a combined water/wastewater service installation as allowed under the UPC.

3.5.9 PRESSURE REDUCTION DEVICES ON SERVICE LINES

A. If the water system pressure exceeds 80 psi, a pressure reducing valve must be installed downstream of the water meter (060.040 - IPC).

3.5.10 SERVICES 2-INCH (2") AND SMALLER

A. Refer to specification Water Transmission and Distribution Lines for comprehensive material requirements. Note the following:

1. Tapping saddle – Mueller/Smith Blair or approved equal
2. Corpstop valve - Mueller/Mc Donald or approved equal; Iron pipe (IP) thread; Teflon Ball with 300 psi rating.
3. Pipe Type – Copper or Pure-core HDPE
4. Curbstop Valve – Mueller or approved equal
5. Valve Box - Mueller/Mc Donald or approved equal; 1 ½" Upper for ¾' & 1"; 2" Upper for 1 ½" & 2"
6. Identification and Marking -

3.5.11 SERVICES LARGER THAN 2-INCH (2")

A. Refer to specification Water Transmission and Distribution Lines for complete requirements. Note the following:

1. Tap – MJ tee or hot tap (stainless steel tapping saddle)
2. Curbstop valve -
3. Pipe Type – ductile iron

4. Valve Box -
5. Identification and Marking -
6. Restraint Systems - All tees, bends, plugs and hydrants must be provided with reaction blocking, tie rods or joints designed to prevent movement.

3.6 WATER METERS

3.6.1 GENERAL REQUIREMENTS

- A. A City-approved water meter (Badger Water Meter, associated with AMR system) must be installed on any water service line. Requirements are defined in the City Code 080.040.020 - Amendments to IPC.
- B. Requests for water meters can be initiated by contacting the City's Utility Billing Office 080.010.020 - Requests for Service).
- C. The meter must be installed in a location that can be accessed for inspection and future maintenance.
- D. A schematic showing typical meter installation, including additional requirements for isolation valves, pressure reducing valves, and cross-connection devices is provided in ____.
- E. The meter installation must be inspected and approved by City staff before the new water service will be turned on 080.040.020 (b) - Installation, Ownership and Maintenance).

3.6.2 MATERIALS

- A. Water meters installed on services smaller than 2" shall be positive displacement Badger Recordall disc meters, or equivalent
- B. Water meters for services 2" and greater shall be Badger Recordall compound meters or equivalent.

3.7 EARTHWORK

3.7.1 SITE CONTROL AND SAFETY

- A. Contractor to provide safe and healthful working conditions on each operation at all times. Contractor shall comply with all provisions, regulations and recommendations issued pursuant to the Occupational Safety and Health Act, and the Construction Safety Act as amended, and with laws, rules and regulations of other authorities having jurisdiction, with regard to all matters relating to the safety and health of workers and the general public. Compliance with government requirements is mandated by law and considered only a minimum level of safety performance. Perform all work in accordance with best safe work practices recognized by the construction industry.

3.7.2 TRAFFIC CONTROL

- A. Refer to Chapter 5, for traffic control requirements.

3.7.3 TRENCHING OPERATIONS

- A. Refer to specification, Trenching, Backfilling, and Compaction for additional information.

3.7.4 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Contractor shall protect all existing structures, utilities and improvements not designated for removal and shall restore damages or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation.

3.7.5 BACKFILL AND COMPACTION

- A. Refer to specification, Trenching, Backfilling, and Compaction for additional information.

3.7.6 STREET PATCHING AND RESTORATION

- A. See Chapter 5, regarding patching and trench restoration.

REFERENCE DOCUMENTS

1. Construction Water Usage Policy
2. CDPHE Criteria for Separation from Pollution Sources
3.
4.
5.

APPENDIX – WATER DISTRIBUTION STANDARD DRAWINGS

CITY STANDARD DRAWINGS	Filename
W01. Concrete Thrust Block Details	
W02. Concrete Thrust Block Details	
W03. Fire Hydrant Assembly	
W04. Gate Valve Detail	
W05. Gate Valve and Box Assembly	
W06. Water Pipe Insulation Detail	
W07. Polyethylene Wrap Detail	
W08. Water Service Connection Detail	
W09. Water Main Concrete Encasement Detail	
W10. Line Valves at Tees and Crosses	
W11 Vertical Bend Anchor Detail	
W12 Water Meter Pit	
W13 Trench Excavation and Backfill Detail	
W14 Irrigation Connection Detail	

Construction Water and Fire Hydrant Usage Policy

The preferred method to draw water for construction- and/or bulk-water use is to utilize the water fill station located at 401 W. 7th St. If use of the water fill station is not feasible (as determined by the City of Glenwood Springs (City)), the City may grant special permission for use of a permitted fire hydrant. The use of a fire hydrant is subject to the requirements outlined in this policy and the "Fire Hydrant Use Permit."

- **Approvals.** The use of a fire hydrant must be pre-approved by the City. Any individual that fails to obtain proper permissions from the City before using a fire hydrant is subject to the penalties defined in the City Municipal Code pertaining to theft of service.
- **Permits.** A "Fire Hydrant Use Permit" is required to use a fire hydrant. Permit applications can be obtained through the City Water Department (970-384-6344) or City website (<http://www.cogs.us/196/Water>).
- **Hydrant Replacement.** Upon expiration of the Fire Hydrant Use Permit, the Permit Holder shall replace the entire fire hydrant assembly that was used to draw construction water, regardless of the amount of water drawn. The hydrant assembly shall be replaced to the shoe. New hydrants and their installation shall conform to current City standards and specifications.
- **Location of Hydrants for Use.** The City Water Department will determine the location(s) of permitted hydrants. The location of an authorized hydrant(s) will be identified on the permit. The use of a fire hydrant not authorized on the permit is prohibited.
- **Water Meter.** The permit holder is responsible for providing a water meter for use on the permitted hydrant. The meter must be installed on the permitted hydrant any time water is being drawn. Meters may be purchased from the City Finance Department (970-384-6425). Alternatively, the permit holder will be allowed to use a meter not purchased through the City, provided that it is certified accurate and is inspected/approved by the City Water Department. The meter shall be functional at all times and available for inspection by City of Glenwood Springs staff at any time.
- **Backflow Prevention Device.** A reduced pressure (RP) backflow prevention device must be installed on the permitted hydrant any time water is being drawn. The permit holder is responsible for providing the backflow device. The backflow device must be tested by a backflow tester certified by the State of Colorado. The test report must be submitted to the City Water Department prior to drawing water from the permitted hydrant.
- **City Inspection and Initial Approval.** The hydrant, meter, and backflow assembly shall be inspected and approved by the City before water is drawn from the permitted hydrant. All devices shall be available for inspection by the City at any time.

- **Permit Posting.** The Permit Holder must have a copy of the permit available for inspection and must ensure the City-issued tag is affixed to the meter/backflow assembly at all times. Failure to comply may result in revocation of the permit.
- **Billing.** The City of Glenwood Springs requires access to the meter at all times. A meter reading will be taken by the City Water Department via photograph and recorded internally. Billing is monthly.
- **Account Setup.** The applicant must have a bulk water account set up before using a fire hydrant. Accounts may be set up through the City Finance Department (970-384-6425).
- **Changes in permit or meter ownership.** The Fire Hydrant Use Permit is issued to the permittee for specific activities, to a specific user. The permit shall not be sold, traded, assigned, transferred, or sublet.
- **Subcontractor Use.** Subcontractors or secondary parties are not allowed to use the Permit Holder's permitted hydrant unless approved in writing by the City. The Permit Holder will remain liable for all usage and damages to their permitted hydrant.
- **Water Use Restrictions.** Permits and bulk water accounts are available for use within the City of Glenwood Springs water service area only. The Permit Holder can only use water for permit-specified purposes within the term of the permit. No hydrant water may be used for human or animal consumption.
- **Refusal of Service.** The City Water Department reserves the right to refuse use of a fire hydrant without justification. Issued permits may be suspended at any time due to water emergencies or other issues that may affect the availability of water.

Fire Hydrant Use Permit Application

PART ONE: CONTACT INFORMATION

APPLICANT'S FULL NAME (RESPONSIBLE PARTY): _____

COMPANY NAME: _____

CONTRACTOR LICENSE NO.: _____

MAILING ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

PHONE: _____

PART TWO: PERMIT INFORMATION

PROJECT ADDRESS: _____

NATURE OF WORK: _____

REASON FOR NOT USING BULK FILL STATION: _____

PROJECT START DATE: _____ PROJECT END DATE: _____

WATER METER:	MAKE:	MODEL:	S/N:
	INITIAL READING:		
RPZ BACKFLOW DEVICE:	MAKE:	MODEL:	S/N:
	TEST DATE:	TEST RECORD PROVIDED? YES NO	

BY SIGNING THIS PERMIT APPLICATION, APPLICANT ACKNOWLEDGES THAT THE ABOVE INFORMATION IS ACCURATE. APPLICANT ACKNOWLEDGES RECEIPT OF CITY OF GLENWOOD SPRINGS HYDRANT USE POLICY AGREES TO ALL OF ITS TERMS AND CONDITIONS.

APPLICANT NAME (PRINTED):	APPLICANT SIGNATURE:

CITY USE ONLY

PERMIT NUMBER:	HYDRANT LOCATION / ID:	BILLING ACCOUNT NUMBER:
APPROVED BY (NAME / SIGNATURE):		



Colorado Department
of Public Health
and Environment

STATE OF COLORADO

DESIGN CRITERIA

FOR

POTABLE WATER SYSTEMS

Water Quality Control Division
Safe Drinking Water Program Implementation Policy #5
Effective: December 15, 2017

5070 8.7.8 External Corrosion

5071 If soils are found to be aggressive, necessary action must be taken to protect the
5072 water main, such as by encasement of the water main in polyethylene, provision of
5073 cathodic protection (in very severe instances), or using corrosion resistant water
5074 main materials.

5075 8.7.9 Separation from Other Utilities

5076 Water mains should be installed to ensure adequate separation from other utilities
5077 such as electrical, telecommunications, and natural gas lines for the ease of
5078 rehabilitation, maintenance, and repair of the water main.

5079 8.8 SEPARATION DISTANCES FROM CONTAMINATION SOURCES

5080 8.8.1 General

5081 The following factors should be considered in providing adequate separation:

- 5082 a. Materials and type of joints for water, sewer (sanitary and storm), raw
5083 surface water, reclaimed water, and liquid petroleum pipes.
- 5084 b. Soil conditions.
- 5085 c. Service and branch connections into the water and sewer pipes.
- 5086 d. Compensating variations in the horizontal and vertical separations.
- 5087 e. Space for repair and alterations of water and sewer pipes.
- 5088 f. Off-setting of water pipes around sewer manholes.

5089 8.8.2 Parallel Installation

- 5090 a. Water mains must be laid at least 10 feet horizontally from any existing or
5091 proposed gravity sanitary or storm sewer, raw surface water pipes,
5092 reclaimed water pipes, liquid petroleum pipes, septic tank, or subsoil
5093 treatment system. The distance must be measured edge to edge.

5094 8.8.3 Crossings

- 5095 a. Water mains crossing gravity sanitary or storm sewers, raw surface water
5096 pipes, reclaimed water pipes, and liquid petroleum pipes must be laid to
5097 provide a minimum vertical distance of 18 inches between the outside of
5098 the water main and the outside of the gravity sanitary or storm sewer, raw
5099 surface water pipe, reclaimed water pipe, and liquid petroleum pipe
5100 (sewer). This must be the case where the water main is either above or
5101 below the sewer with preference to the water main being located above
5102 the sewer.
- 5103 b. At crossings, one full length of water pipe must be located so both joints
5104 will be as far from the sewer as possible. Special structural support for the
5105 water and sewer pipes may be required.

5106 8.8.4 Exception

5107 When it is impossible to obtain the minimum 10 foot horizontal separation distance
5108 of Item 8.8.2, the following methods of installation may be used:

- 5109 a. Exceptions to the horizontal separation distance are allowed, provided that
5110 the water main is laid in a separate trench or on an undisturbed earth shelf
5111 located on the “uphill” side of the sewer at such an elevation that the

5112 bottom of the water main is at least 18 inches above the top of the sewer.
5113 The sewer materials must be water works grade 150 psi (1.0 Mpa) pressure
5114 rated pipe meeting AWWA standards or similar and must be pressure tested
5115 to ensure water tightness.

5116 b. The design engineer (i.e., Colorado registered professional engineer) may
5117 deviate from the minimum 10 foot horizontal separation distance and the
5118 exception listed above if the design engineer provides a similar solution
5119 that can be justified to provide equivalent protection to the water from
5120 contamination.

5121 When it is impossible to obtain the minimum 18 inch vertical separation distance of
5122 Item 8.8.3, the following methods of installation may be used:

5123 c. If the sewer pipe will cross less than 18 inches above or under the water
5124 main, either the water main or sewer pipe must be installed with secondary
5125 containment. Acceptable options include a pipe casing extending no less
5126 than 9-feet each side of the crossing. The pipe casing must be of watertight
5127 material with no joints. The casing pipe materials may be steel, ductile
5128 iron, fiberglass, fiberglass reinforced polymer mortar (FRPM), or
5129 polyvinylchloride (PVC) with suitable carrier pipe supports and casing pipe
5130 end seals. The design must include a means to support the sewer pipe to
5131 prevent settlement and permit maintenance of the water main without
5132 damage to the sewer pipe or water main. Alternatively, concrete or
5133 controlled low strength material (e.g., flowable fill) encasement of either
5134 pipe extending no less than 10-feet each side of the crossing may be used.
5135 Crossings involving jointless pipe such as HDPE, fusible PVC or welded steel
5136 do not require installation of secondary containment.

5137 d. The design engineer (i.e., Colorado registered professional engineer) may
5138 deviate from the minimum 18 inch vertical separation distance and the
5139 exception listed above if the design engineer provides a similar solution
5140 that they consider to provide equivalent protection to the water from
5141 contamination.

5142 8.8.5 Force Mains

5143 There must be at least a 10 foot horizontal separation between water mains and
5144 sanitary sewer force mains. There must be an 18 inch vertical separation at
5145 crossings as required in Item 8.8.3. Exceptions to these separation distances must
5146 be in accordance with Item 8.8.4.

5147 8.8.6 Sewer Manholes

5148 Water pipes must not pass through or come in contact with any part of a sewer
5149 manhole. Water mains should be located at least 10 feet from sewer manholes.

5150 8.8.7 Separation of Water Mains from Other Sources of Contamination

5151 Design engineers should exercise caution when locating water mains at or near
5152 certain sites such as sewage treatment plants or industrial complexes. On site
5153 waste disposal facilities including absorption fields must be located and avoided.
5154 The engineer must contact the Department to establish specific design
5155 requirements for locating water mains near any source of contamination.

5156 8.9 SURFACE WATER CROSSINGS

5157 Surface water crossings, whether over or under water, present special problems. The
5158 Department should be consulted before final plans are prepared.

5159 8.9.1 Above-Water Crossings

5160 The pipe must be adequately supported and anchored, protected from vandalism,
5161 damage and freezing, and accessible for repair or replacement.

5162 8.9.2 Underwater Crossings

5163 A minimum cover of five feet must be provided over the pipe unless otherwise
5164 approved by the Department. When crossing water courses which are greater than
5165 15 feet in width, the following must be provided:

- 5166 a. The pipe must be of special construction, having flexible, restrained or
5167 welded watertight joints.
- 5168 b. Valves must be provided at both ends of water crossings so that the section
5169 can be isolated for testing or repair; the valves must be easily accessible,
5170 and not subject to flooding.
- 5171 c. Permanent taps or other provisions to allow insertion of a small meter to
5172 determine leakage and obtain water samples on each side of the valve
5173 closest to the supply source.

5174 8.10 CROSS-CONNECTIONS AND INTERCONNECTIONS

5175 8.10.1 Cross-Connections

5176 There must be no connection between the distribution system and any pipes,
5177 pumps, hydrants, or tanks whereby unsafe water or other contaminating materials
5178 may be discharged or drawn into the system. Each water utility must have a
5179 program conforming to Chapter 12 of the Colorado Primary Drinking Water
5180 Regulations.

5181 8.10.2 Cooling Water

5182 Neither steam condensate, cooling water from engine jackets, nor water used in
5183 conjunction with heat exchange devices must be returned to the potable water
5184 supply.

5185 8.10.3 Interconnections

5186 The approval of the Department must be obtained for interconnections between
5187 potable water supplies. Consideration should be given to differences in water
5188 quality.

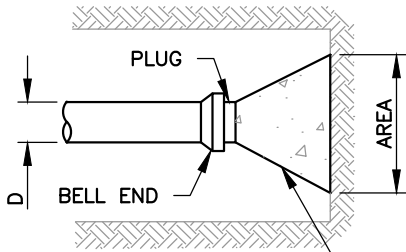
5189 8.11 WATER SERVICES AND PLUMBING

5190 8.11.1 Plumbing

5191 Water services and plumbing must conform to the applicable local and/or state
5192 plumbing codes. Solders and flux containing more than 0.2% lead and pipe and pipe
5193 fittings containing more than 8% lead must not be used. After January 1, 2014,
5194 pipes or pipe fittings must not contain more than 0.25% lead.

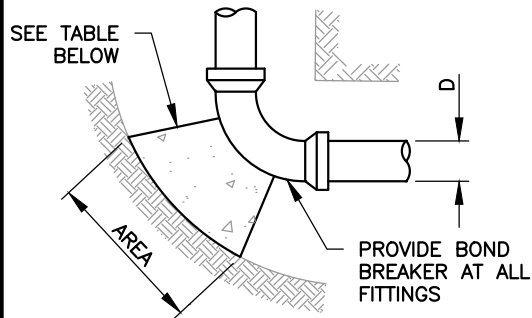
5195 8.11.2 Booster Pumps

5196 Booster pumps must be designed in accordance with Chapter 6.

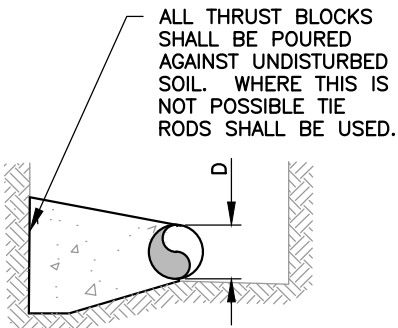


DEAD END LINE

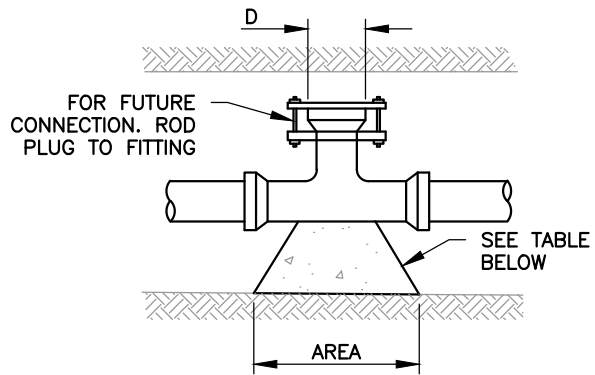
SEE TABLE SHEET W2



BENDS & ELBOWS

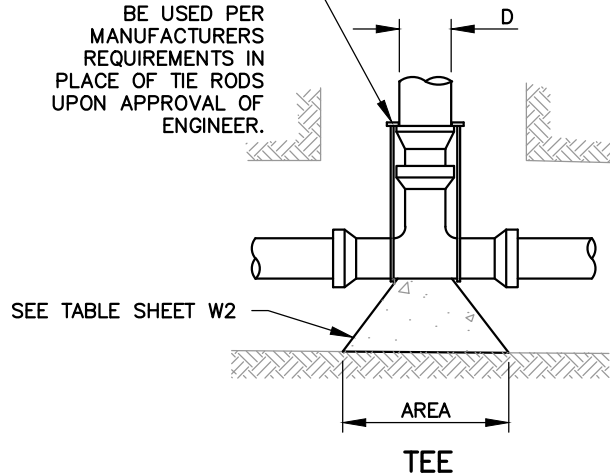


SECTION



PLUGGED TEE

WHERE REDUCER IS USED, ROD BACK TO TEE. MEG-A-LUG MAY BE USED PER MANUFACTURERS REQUIREMENTS IN PLACE OF TIE RODS UPON APPROVAL OF ENGINEER.



TEE



City of Glenwood Springs
101 West 8th Street
Glenwood Springs, CO 81601
970.384.6435
www.ci.glenwood-springs.co.us

Division:

Concrete Thrust Block Details

Water Standard Details

Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: WaterThrustBlocks

Drawing #

W01

BEARING AREAS (IN SQ. FT.)					
SIZE	BENDS				TEES, DEAD ENDS, AND CROSS w DEAD END BRANCHES
	90°	45°	22 1/2°	11 1/2°	
3	1.0	0.6	0.3	0	0.7
4	1.8	1.0	0.5	0	1.3
6	4.0	2.2	1.1	0	2.8
8	7.1	3.8	2.0	1.0	5.0
10	11.1	6.0	3.0	1.5	7.8
12	16.0	8.6	4.4	2.2	11.3
14	21.7	11.8	6.0	3.0	15.4
15	25.0	13.5	7.0	3.5	17.6
16	28.4	15.3	8.0	4.0	20.0
18	36.0	19.4	10.0	5.0	25.4
20	44.2	24.0	12.2	6.1	31.4
21	49.0	26.5	13.5	6.8	34.6
22	54.0	29.0	14.8	7.4	38.0
24	64.0	34.5	17.7	8.8	45.0
30	100.0	54.0	27.6	13.8	71.0
36	144.0	78.0	40.0	20.0	102.0

NOTE: TEE SIZE IS BRANCH SIZE.

AREAS GIVEN IN TABLE ARE BASED UPON INTERNAL STATIC PRESSURE OF 100 P.S.I.
AND SOIL BEARING CAPACITY OF 1,000 lbs. PER SQ. FT.

BEARING AREAS FOR ANY PRESSURE AND SOIL BEARING CAPACITY MAY BE OBTAINED
BY MULTIPLYING TABULATED VALUES BY A CORRECTION FACTOR "F"

$$F = \frac{\text{ACTUAL SPECIFIED TEST PRESSURE IN HUNDREDS OF lbs.}}{\text{ACTUAL SOIL BEARING CAPACITY IN THOUSANDS OF lbs.}}$$

SOIL BEARING CAPACITIES SHALL BE DETERMINED BY THE ENGINEER

ALL WATER LINE PLANS SHALL CONTAIN THE FOLLOWING TABLE, WITH THE VALUES
FILLED IN BY THE ENGINEER:

SOIL BEARING CAPACITY - _____ LBS/SQ. FT.
TEST PRESSURE - _____ P.S.I.
BEARING AREA MULTIPLIER (F) - _____

CONCRETE THRUST BLOCK DETAILS

N.T.S.



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970.384.6435
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Concrete Thrust Block Details

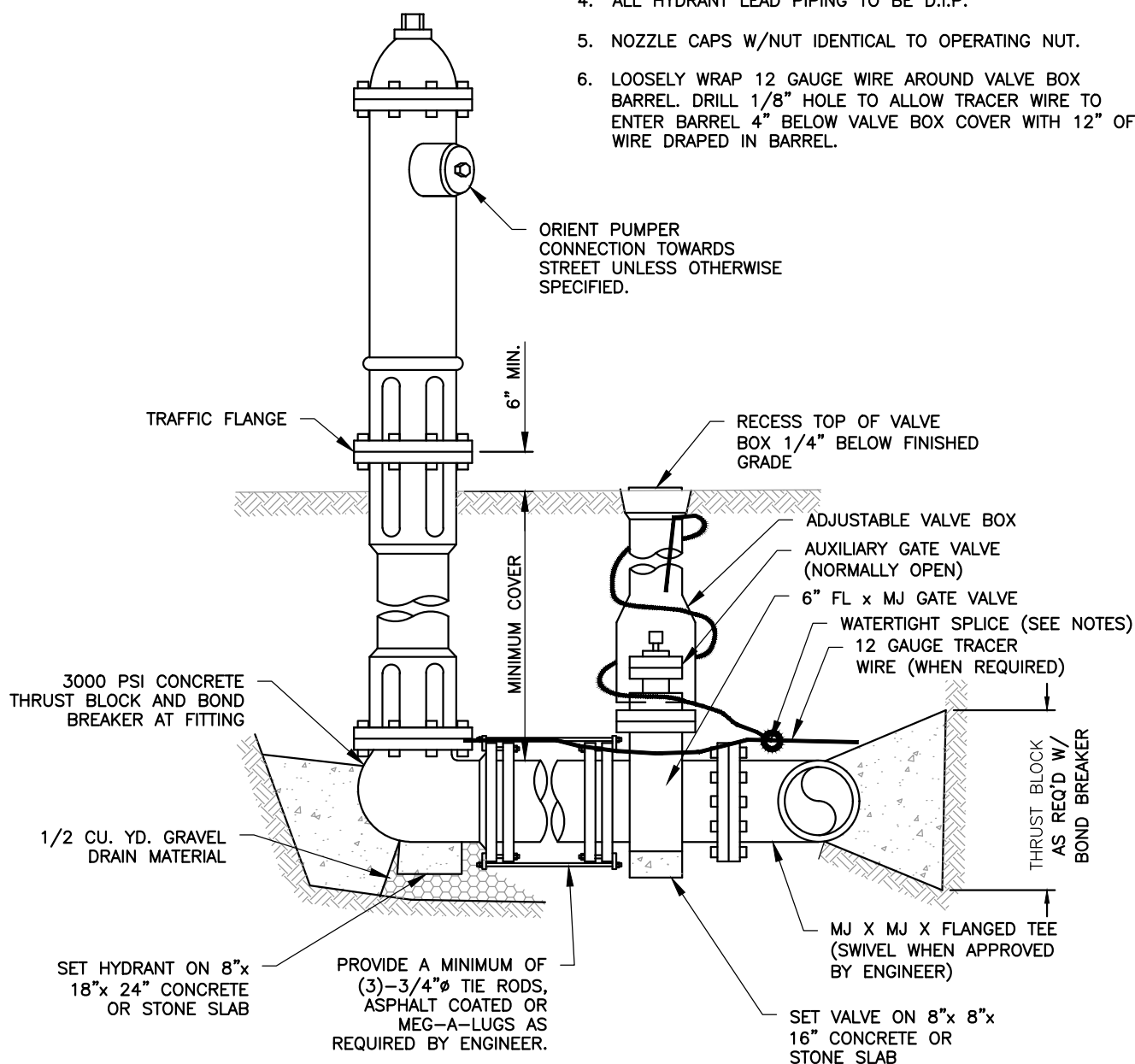
Water Standard Details

Approved:	XX
Date:	2/23/16
Modified:	2/23/16
File:	WaterThrustBlocksA12

Drawing #
W02

NOTES:

1. ALL JOINTS FROM MAIN TO HYDRANT SHALL BE HARNESSSED MECHANICAL JOINTS OR FLANGED JOINTS.
2. HYDRANT, VALVE & FITTINGS TO BE 250 PSI RATED.
3. POLYETHYLENE WRAP (WHEN REQUIRED) SHALL COVER ASSEMBLY FROM HYDRANT BASE TO WATER MAIN.
4. ALL HYDRANT LEAD PIPING TO BE D.I.P.
5. NOZZLE CAPS W/NUT IDENTICAL TO OPERATING NUT.
6. LOOSELY WRAP 12 GAUGE WIRE AROUND VALVE BOX BARREL. DRILL 1/8" HOLE TO ALLOW TRACER WIRE TO ENTER BARREL 4" BELOW VALVE BOX COVER WITH 12" OF WIRE DRAPED IN BARREL.



FIRE HYDRANT ASSEMBLY DETAIL

N.T.S.



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101 West 8th Street
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Fire Hydrant Assembly Detail

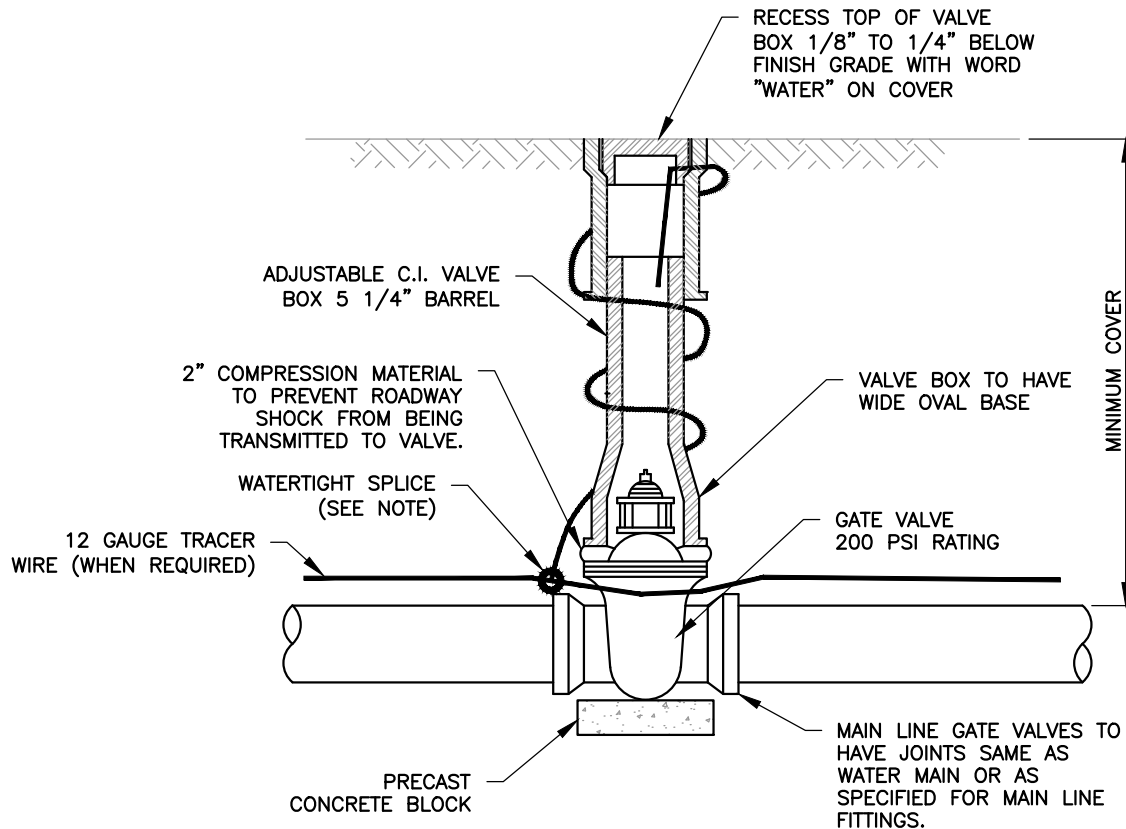
Water Standard Details

Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: WaterFireHydrantDetail

Drawing #

W03

NOTE:
 LOOSELY WRAP 12 GAUGE
 WIRE AROUND VALVE BOX
 BARREL. DRILL 1/8" HOLE TO
 ALLOW TRACER WIRE TO ENTER
 BARREL 4" BELOW VALVE BOX
 COVER WITH 12" OF WIRE
 DRAPED IN BARREL.



GATE VALVE DETAIL
 N.T.S.



City of Glenwood Springs
 101 West 8th Street
 Glenwood Springs, CO 81601
 970.384.6435
www.ci.glenwood-springs.co.us

Division:

Gate Valve Detail

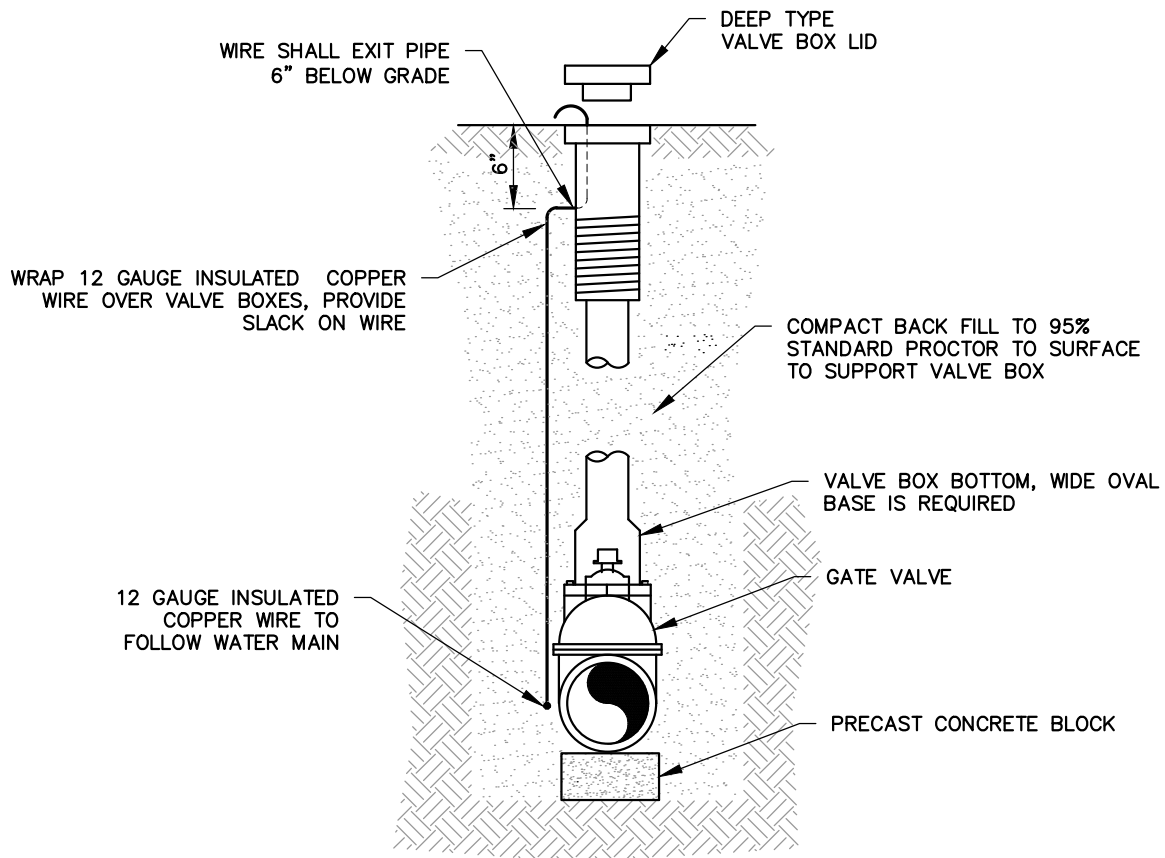
Water Standard Details

Approved:	XX
Date:	2/23/16
Modified:	2/23/16
File:	WaterGateValveDetail

Drawing #

W04

IF THE DISTANCE TO THE TOP OF THE OPERATING NUT TO THE TOP OF THE VALVE COVER IS GREATER THAN 9', AN EXTENSION STEM WILL BE REQUIRED ON THE OPERATING NUT. THE EXTENSION MUST BE SECURED TO THE VALVE OPERATING NUT.



GENERAL NOTE

1. VALVE BOX IS TO BE INSTALLED PLUMB, LEVEL, AND CENTERED ON 2" NUT

GATE VALVE & BOX ASSEMBLY DETAIL

N.T.S.



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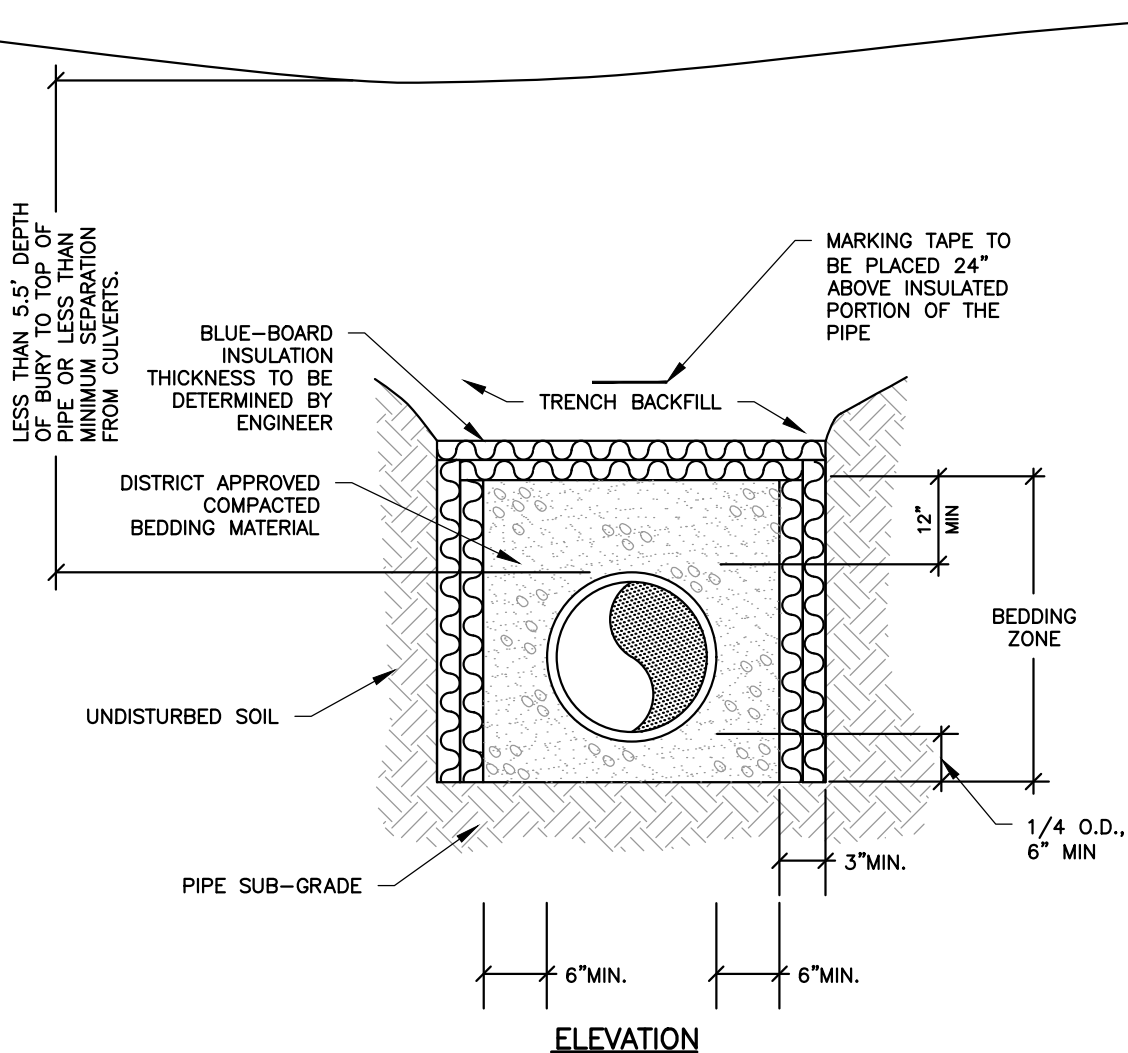
Gate Valve And Box Assembly

Water Standard Details

Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: GateValveAndBoxAssembly

Drawing #

W05



GENERAL NOTES

1. CONDITION OF LESS THAN MINIMUM BURY DEPTH ALLOWED ONLY WITH WRITTEN APPROVAL FROM THE CITY PRIOR TO CONSTRUCTION. INSULATION SHALL BE INSTALLED ON ALL PIPE THAT DOES NOT MEET MINIMUM BURY REQUIREMENTS.
2. SEE SEWER AND WATER PIPE BEDDING DETAIL FOR BACKFILL MATERIAL AND COMPACTION SPECS.
3. INSULATION SHALL BE INSTALLED ON ALL PIPE THAT IS WITHIN TWO FEET OF ANY DRAINAGE CULVERT. THIS APPLIES TO THE BOTTOM OF THE PIPE IF IT CROSSES OVER TOP OF THE CULVERT.

WATER PIPE INSULATION DETAIL

N.T.S.



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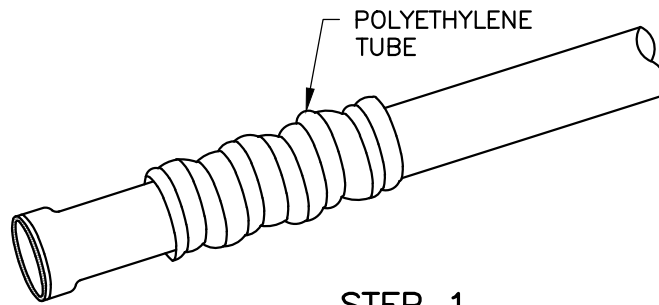
Water Pipe Insulation Detail

Water Standard Details

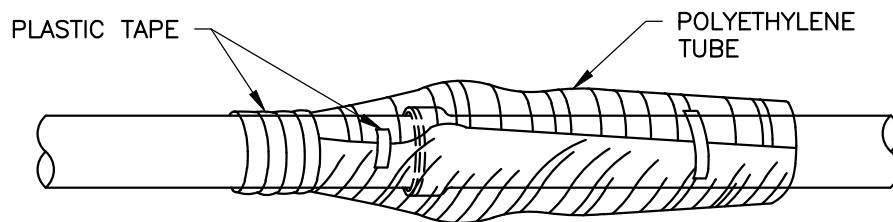
Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: WaterPipeInsulationDetail

Drawing #

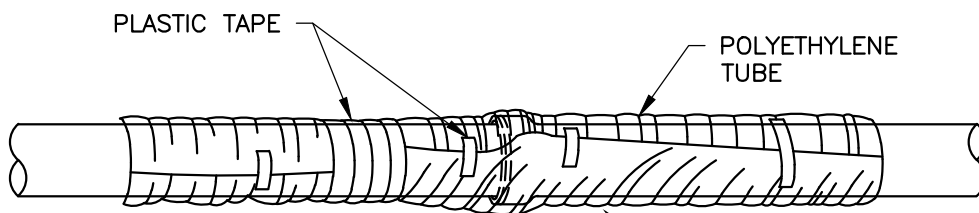
W06



STEP 1



STEP 2



STEP 3

EXERCISE CARE TO PREVENT PENETRATION OF PE WRAP WITH GRAVEL, ROCKS, ETC. WHEN BACKFILLING TRENCH.

FIELD INSTALLATION – POLYETHYLENE WRAP

WHERE SPECIFICALLY REQUIRED FOR SOIL APPLICATIONS

STEP 1 – PLACE TUBE OF POLYETHYLENE MATERIAL ON PIPE PRIOR TO LOWERING IT INTO PLACE

STEP 2 – PULL THE TUBE OVER THE LENGTH OF THE PIPE. TAPE TUBE TO PIPE AT JOINT. FOLD MATERIAL AROUND THE ADJACENT SPIGOT END AND WRAP WITH TAPE TO HOLD THE PLASTIC TUBE IN PLACE.

STEP 3 – OVERLAP FIRST TUBE WITH ADJACENT TUBE AND SECURE WITH PLASTIC ADHESIVE TAPE. THE POLYETHYLENE TUBE MATERIAL COVERING THE PIPE SHALL BE LOOSE. EXCESS MATERIAL SHALL BE NEATLY DRAWN UP AROUND THE PIPE BARREL, FOLDED ON TOP OF PIPE AND TAPED IN PLACE.

POLYWRAP DETAIL

N.T.S.



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Division:

Polywrap Detail

Water Standard Details

Approved: XX

Date: 2/23/16

Modified: 2/23/16

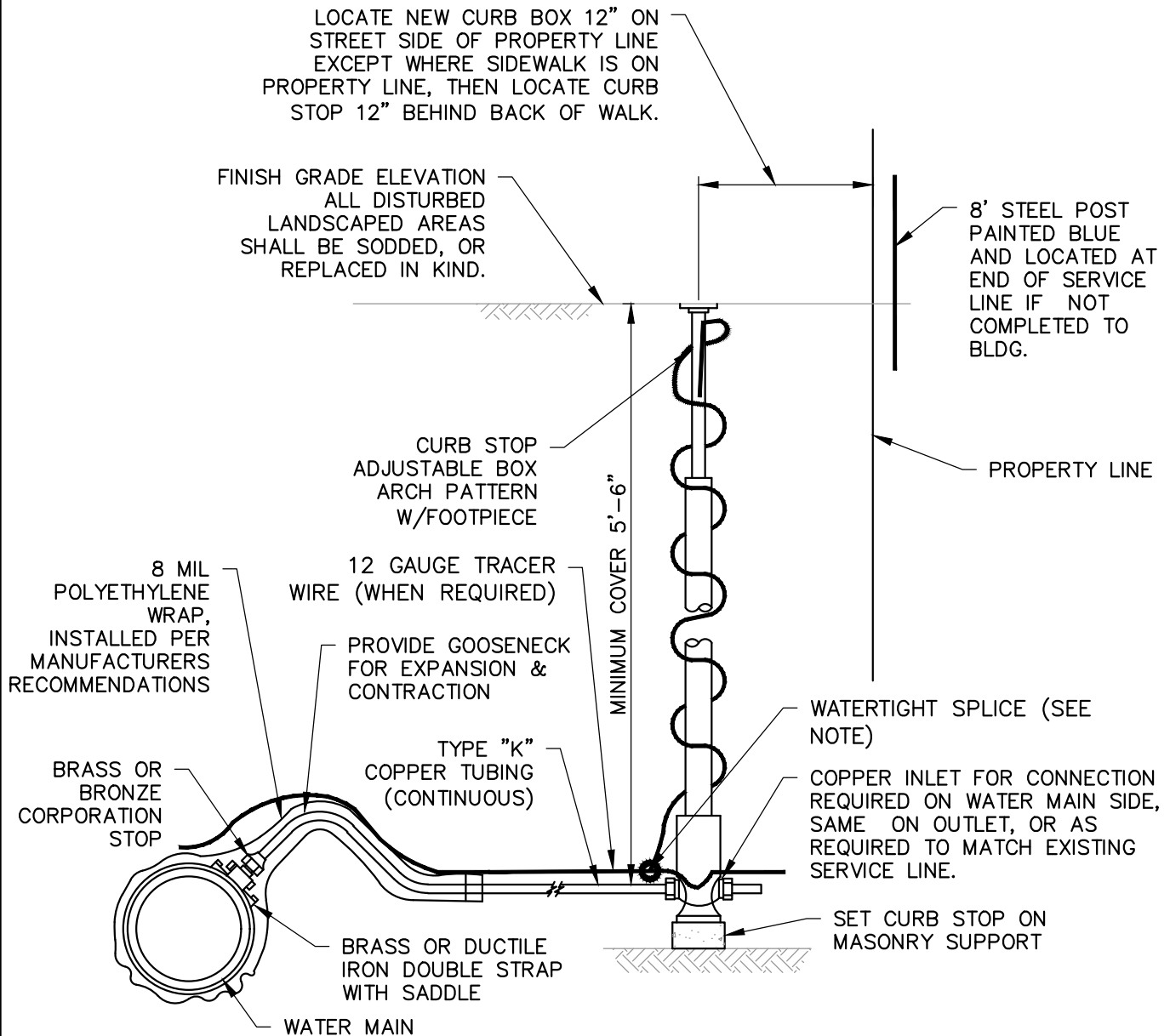
File: WaterPolywrapDetail

Drawing #

W07

NOTE:

LOOSELY WRAP 12 GAUGE WIRE AROUND VALVE BOX BARREL. DRILL 1/8" HOLE TO ALLOW TRACER WIRE TO ENTER BARREL 4" BELOW VALVE BOX COVER WITH 12" OF WIRE DRAPED IN BARREL.



WATER SERVICE CONNECTION DETAIL

N.T.S.



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101 West 8th Street
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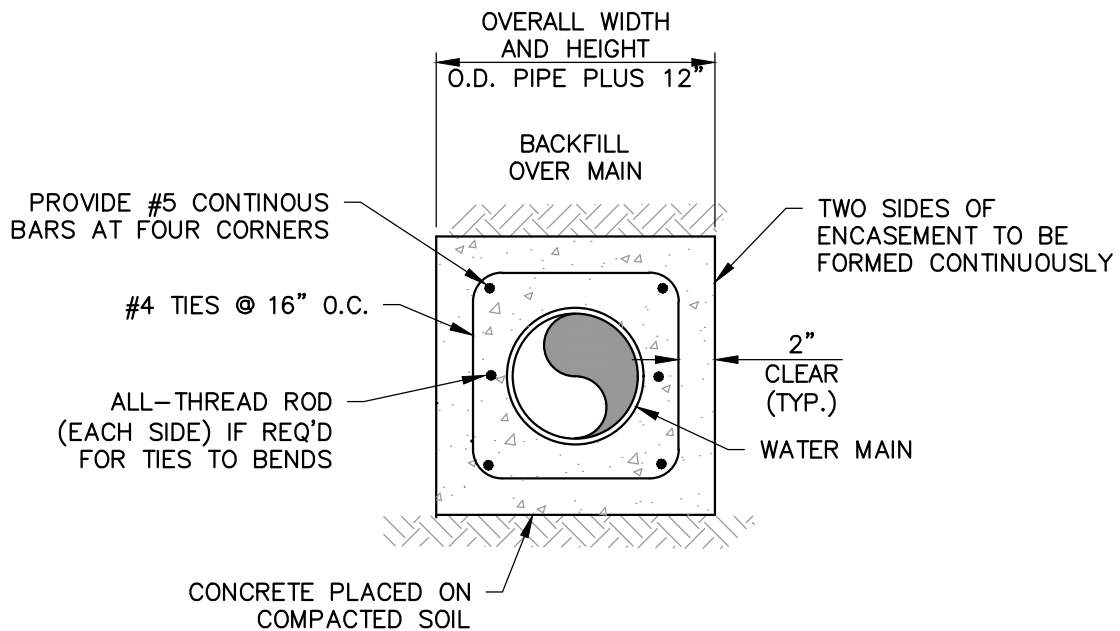
Water Service Connection Detail

Water Standard Details

Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: WaterServiceDetail

Drawing #

W08



WATER MAIN CONCRETE ENCASEMENT DETAIL
N.T.S.



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101 West 8th Street
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www.ci.glenwood-springs.co.us

Water Main Concrete Encasement Detail

Water Standard Details

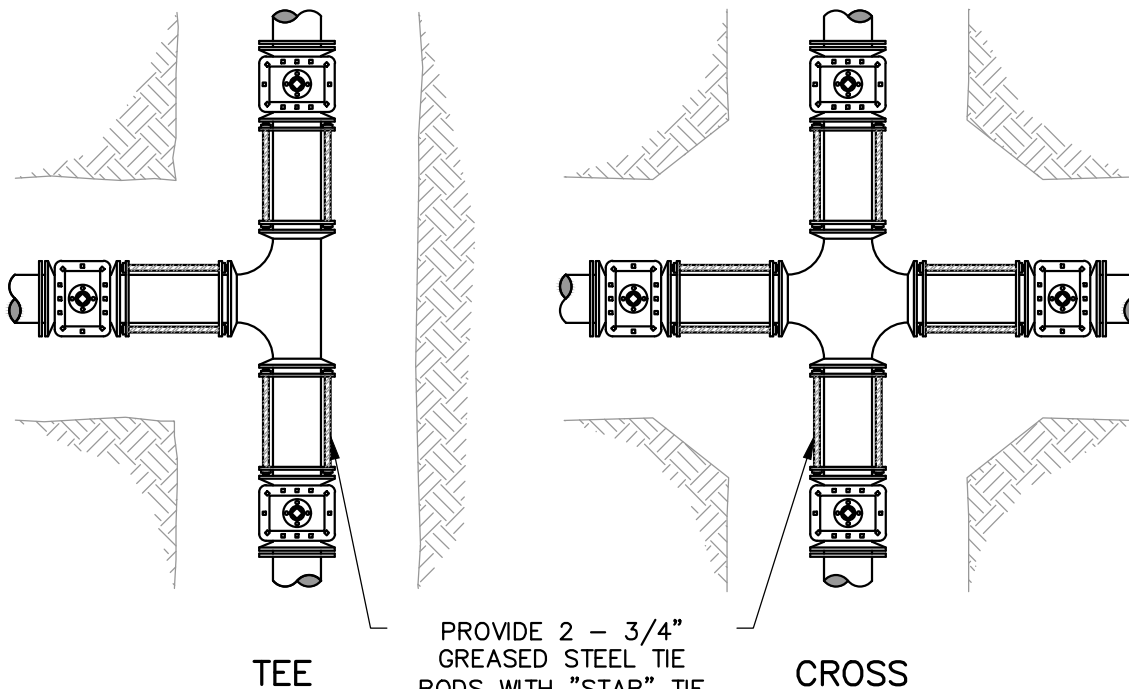
Division:

Approved:	XX
Date:	2/23/16
Modified:	2/23/16
File:	WaterEncaseDetail

Drawing #

W09

NOTE: USE OF FOSTER
ADAPTERS OR SWIVEL TEES
SHALL BE ALLOWED, IF
APPROVED BY THE CITY.



LINE VALVES AT TEES AND CROSSES
N.T.S.



City of Glenwood Springs
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Division:

Line Valves at Tees and Crosses

Water Standard Details

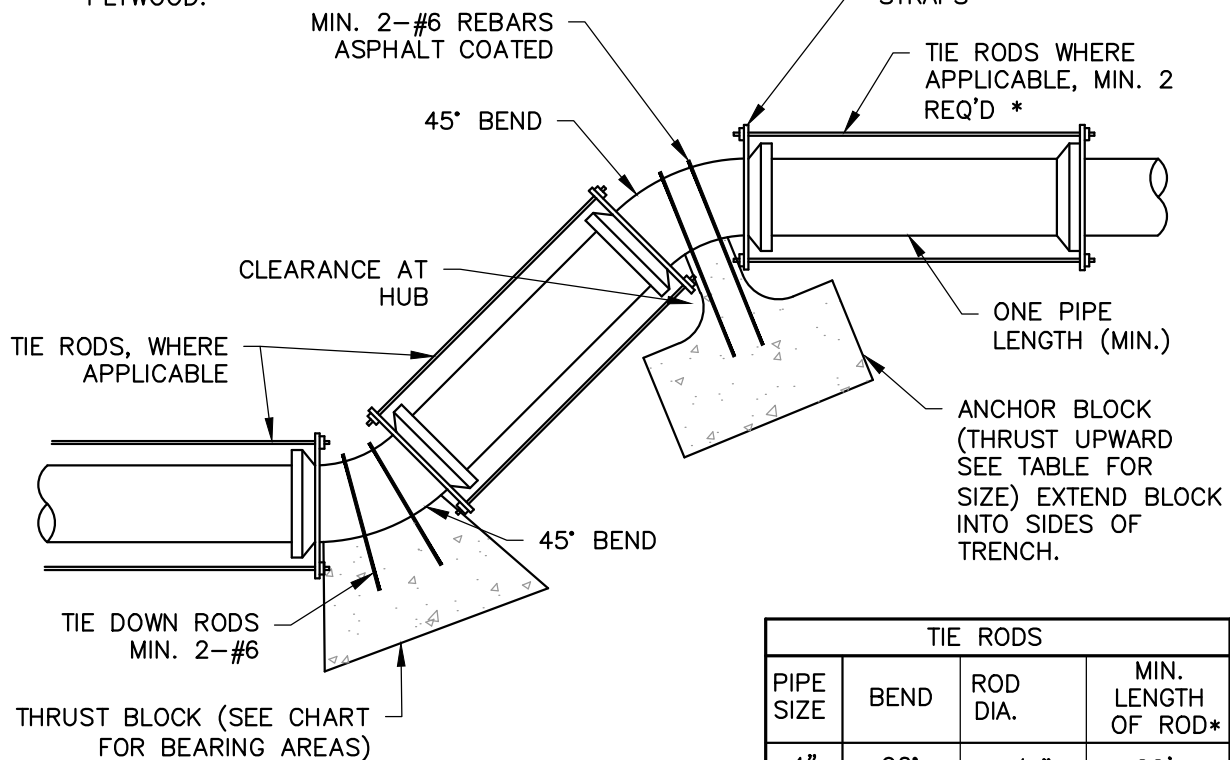
Approved:	XX
Date:	2/23/16
Modified:	2/23/16
File:	WaterValvesTeeCross

Drawing #

W10

NOTES

1. USE CONCRETE THRUST BLOCKS & ANCHOR BLOCK FOR PLASTIC PIPE, (NO TIERODS).
2. FOR CAST IRON PIPE USE EITHER TIE RODS OR CONCRETE BLOCKS.
3. ANCHOR BLOCK WEIGHTS AND TIE ROD SIZE & LENGTH BASED ON 200 PSI PRESSURE & 4-1/2 FT. OF COVER. WHERE WORKING PRESSURE EXCEEDS ABOVE, ANCHORS TO BE SPECIAL CONSTRUCTION.
4. MEGA-LUG MAY BE USED PER MANUFACTURERS REQUIREMENTS IN PLACE OF TIE RODS UPON APPROVAL OF ENGINEER.
5. PIPE LARGER THAN TO BE SPECIFICALLY DESIGNED BY ENGINEER. FORMS SHALL BE 3/8" PLYWOOD.



MIN WEIGHT OF ANCHOR BLOCK			
PIPE SIZE	90° BEND	45° BEND	22 1/2° BEND
2"	150#	150#	150#
3"	900#	450#	150#
4"	1600#	900#	450#
6"	6050#	2400#	700#
8"	12,300#	5750#	2000#
10"	22,500#	12,100#	6200#
12"	32,100#	17,400#	8900#

TIE RODS			
PIPE SIZE	BEND	ROD DIA.	MIN. LENGTH OF ROD*
4"	90°	3/4"	22'
	45°	3/4"	7'
	22 1/2°	3/4"	2'
6"	90°	3/4"	35'
	45°	3/4"	10'
	22 1/2°	3/4"	3'
8"	90°	1"	48'
	45°	3/4"	14'
	22 1/2°	3/4"	4'
12"	90°	1 1/4"	78'
	45°	3/4"	22'
	22 1/2°	3/4"	6'

NOTE:

WEIGHT OF CONCRETE EQUALS
150#/CU. FT.

* ACTUAL LENGTH OF ROD TO BE SUCH THAT STRAP CAN BE PLACED BEYOND FIRST COLLAR OR HUB AT OR BEYOND THE MINIMUM LENGTH SHOWN.

VERTICAL BEND ANCHOR DETAIL

N.T.S.



City of Glenwood Springs
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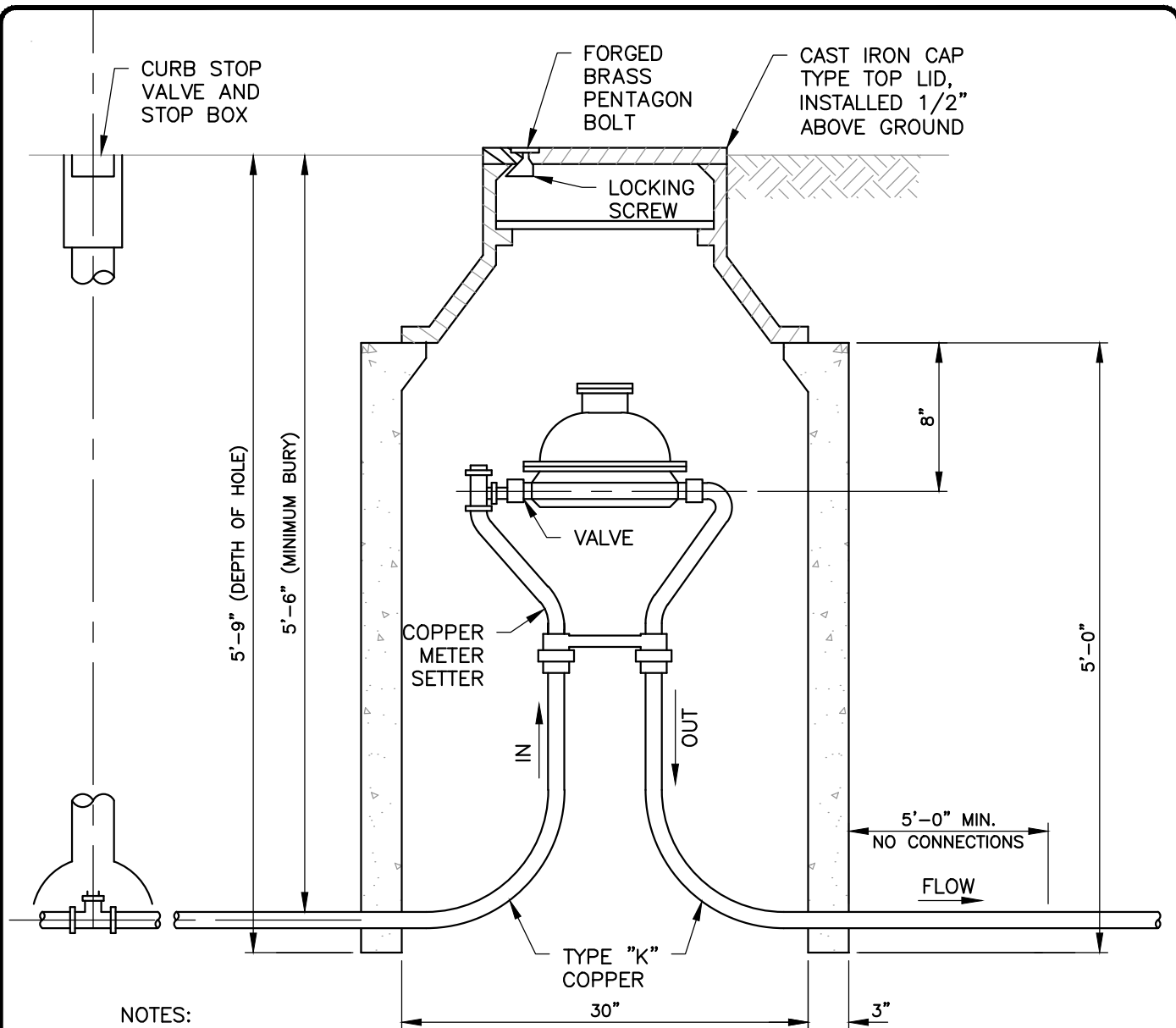
Vertical Bend Anchor Detail

Water Standard Details

Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: WaterVerticalBendAnchorDetail

Drawing #

W11



NOTES:

1. NOT FOR INSTALLATION IN ROADWAYS, DRIVEWAYS, OR PARKING AREAS.
2. NO CONCRETE FLOOR TO BE LAID IN METER PIT.
3. ADJUSTMENT RINGS SHALL BE 2", 3", 4" OR 6" IN HEIGHT, USE AS NECESSARY.
4. NO CONNECTIONS OR CHANGES IN PIPE DIAMETER SHALL BE MADE IN THE METER PIT OR IN THE DISTANCE OF FIVE FEET BEYOND THE METER PIT WALL ON THE OUTLET SIDE.
5. LAWN SPRINKLER CONNECTIONS SHALL BE A MINIMUM OF FIVE FEET FROM THE METER PIT WALL ON THE OUTLET SIDE.

WATER METER PIT
N.T.S.



City of Glenwood Springs
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Division:

Water Meter Pit

Water Standard Details

Approved: XX
Date: 2/23/16
Modified: 2/23/16
File: WaterMeterPit

Drawing #

W12

